REMARKS

Claims 1-4 and 6-27 are currently pending in the subject application and are presently under consideration. Claims 1, 3-4, 11, 16, 17 and 22 have been amended as shown on pp. 2-9 of the Reply. Claims 2 and 23 have been canceled.

Favorable reconsideration of the subject patent application is respectfully requested in view of the comments and amendments herein.

I. Rejection of Claims 1-4, 6-10 and 17-21 Under 35 U.S.C. §112, First Paragraph

Claims 1-4, 6-10 and 17-21 stand rejected under 35 U.S.C. §112, First Paragraph as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. The claims have been amended to remove the specified limitations, as such the rejection is moot and should be withdrawn.

II. Objection to the drawings

The drawings have been objected to under 37 CFR §1.83(a), as not showing every feature of the invention specified in the claims. The claims have been amended to remove the specified features, as such the objection is moot and should be withdrawn.

III. Rejection of Claim 11-15 Under 35 U.S.C. §103(a)

Claims 11-15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sudo *et al.* (US Patent 4,644,205) in view of Chitayat *et al.* (US 5,777,402), Spinner *et al.* (US 5,771,174) and Mizutani (US Patent 5,532,533). It is respectfully submitted that this rejection should be withdrawn for the following reasons. Sudo *et al.*, Chitayat *et al.*, Spinner *et al.* and Mizutani, individually or in combination, do not teach or suggest each and every element set forth in the subject claims.

> To reject claims in an application under §103, an examiner must show an unrebutted *prima facie* case of obviousness. A *prima facie* case of obviousness is established by a showing of three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or

> references when combined) must teach or suggest all the claim limitations. *See* MPEP §706.02(j). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicants' disclosure. *See In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicants' claimed subject matter relates to a system and method to control a rotary-linear actuator. An integrated rotary-linear actuator system is provided that includes a control system and an associated rotary-linear motor, which may be integrated into a single module. The motor includes a moveable plunger and associated coils. When the coils are energized, they interact with magnets to effect corresponding movement of the plunger, which may include rotation and/or linear movement. Independent claim 11 recites a rotary-linear actuator system, comprising: *a motor support having a well; a plunger supported for movement…; an array of permanent magnets associated with the plunger,…; a first set of coils arranged to, when energized, apply an electric field…; a second set of coils arranged to, when energized, apply an electric field…; an integrated control system…, the control system comprising an amplifier coupled to the first and second sets of coils and being operative to selectively energize the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes, the integrated control system…; and* ***an encoder system coupled to the integrated control system for determining the position of the plunger, the encoder system is affixed to a surface of the array of permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the first and second sets of coils based on the position information from the encoder system so as to effect desired movement of the plunger***. Sudo *et al.*, Chitayat *et al.*, Spinner *et al.* and Mizutani., individually or in combination, fail to teach or suggest such aspects of the claimed subject matter.

Sudo *et al.* discloses a positioning device of magnetic suspension type, comprising a stationary member; a movable member to be disposed in a non-contact state to the stationary member; magnetic support means including at least one magnetic circuit for supporting the movable member in non-contact state with respect to the stationary member by using the magnetic forces generated by the magnetic circuit; detecting means for detecting the position of the movable member relative to the stationary member; and driving means for generating a drive force for moving and positioning the movable member relative to the stationary member. (*See* col. 1, lines 46-68).

In contrast, applicants' claimed subject matter discloses an integrated rotary-linear actuator system that includes a control system and an associated rotary-linear motor, which may be integrated into a single module. The motor includes a moveable plunger and associated coils. When the coils are energized, they interact with magnets to effect corresponding movement of the plunger, which may include rotation and/or linear movement. The system further includes a processor coupled to one or more amplifiers. Because the processor and amplifiers are integrated within the control system, a voluminous wiring harness may be obviated. Each of the amplifiers is coupled to a respective one of the coils and is operative to control energization of the respective coils. The amplifiers may include switching networks for providing a desired level of electrical current (*e.g.*, by pulse-width-modulation or linear current control) to the coils based on control signals from the processor.

The processor also is connected to the encoder system for receiving position information indicative of the position and/or movement of the plunger. The encoder system is affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. The processor thus controls the amplifiers, and in turn, controls energization of each phase of the respective coils based on the position information so as to effect desired movement of the plunger. (*See* pg. 7, lines 5-8 and pg. 11, line 30-pg. 12, line 10).

Whereas, Sudo *et al.* merely discloses a position detection means for detecting the position of the floating member relative to the stationary member. Sensors are provided on upper and lower portions of the outer periphery of the inner cylinder of the stationary member. Each of the sensors consist of eddy current type distance sensors and can measure the distance of the floating member up to the inner periphery of the inner cylinder. (*See* col. 4, lines 1-10). Sudo *et al.* does not disclose an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Sudo *et al.* is silent with regard to a ... *control system comprising an amplifier coupled to the first and second sets of coils and being operative to selectively energize the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes, the integrated control system...; and* ***an encoder system coupled to the integrated control system for determining the position of the plunger, the encoder system is affixed to a surface of the array of permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls***

the amplifier and, in turn, controls energization of each phase of the first and second sets of coils based on the position information from the encoder system so as to effect desired movement of the plunger.

Chitayat *et al.* does not make up for the aforementioned deficiencies of Sudo *et al.* with respect to independent claim 11 (which claims 12-15 depend there from). Chitayat *et al.* discloses a two-axis motor with high density magnetic platen. An X-Y positioning machine has a forcer, with armature coils, that moves around on a platen, supported by an air bearing. Magnets embedded in the motor platen generate a fixed magnetic field with which the armature coils interact. (*See* col. 1, lines 40-67). The Examiner cites Chitayat *et al.* for providing an array of magnets wherein half of the magnets are oriented such that their north poles point radially outward and the other half such that their north poles point radially inward, the array arranged as alternating columns of alternating polarity. (*See* Office Action dated 8-21-06, pg. 5). Thus, Chitayat *et al.* does not disclose an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Chitayat *et al.* is silent with regard to a ... *control system comprising an amplifier coupled to the first and second sets of coils and being operative to selectively energize the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes, the integrated control system...; and* ***an encoder system coupled to the integrated control system for determining the position of the plunger,...***.

Spinner *et al.* does not make up for the aforementioned deficiencies of Sudo *et al.* and Chitayat *et al.* with respect to independent claim 11 (which claims 12-15 depend there from). Spinner *et al.* discloses a distributed intelligence control system for controlling a cross direction profile characteristic of a traveling sheet, such as paper, during production. The system includes a scanner for measuring a property of the sheet at a plurality of cross direction locations and producing output signals indicative of the cross direction profile characteristic. The system further includes a plurality of actuators, each actuator being operatively associated with a corresponding intelligent actuator controller. (*See* col. 3, lines 35-50). The Examiner cites Spinner *et al.* for providing an intelligent actuator controller mounted on the body of the actuator and thus integrated with the actuator. Each actuator controller comprises a communications transceiver that comprises a "network interface" via passing communications from an actuator controller to the network and host control system. (*See* Office Action dated 8-21-06, pg. 5). Thus, Spinner *et al.* does not disclose an encoder system affixed to the surface of the magnets and

etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Spinner *et al.* is silent with regard to a ... *control system comprising an amplifier coupled to the first and second sets of coils and being operative to selectively energize the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes, the integrated control system...; and* ***an encoder system coupled to the integrated control system for determining the position of the plunger,...***.

Mizutani does not make up for the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.*, and Spinner *et al.* with respect to independent claim 11 (which claims 12-15 depend there from). Mizutani discloses a servo motor integral with a control apparatus. The servo motor has an amplifier section and a partition body which constitutes a partition between an amplifier section and a servo motor section. The integrated apparatus is contained within a housing that provides support for the elements and includes a printed circuit board, bearings and position/velocity detector. (*See* col. 4, lines 13-26). The Examiner cites Mizutani for providing a servo motor integral with its control apparatus. (*See* Office Action dated 8-21-06, pg. 6). Thus, Mizutani does not disclose an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Mizutani is silent with regard to a ... *control system comprising an amplifier coupled to the first and second sets of coils and being operative to selectively energize the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes, the integrated control system...; and* ***an encoder system coupled to the integrated control system for determining the position of the plunger,...***.

Thus, the combination of Sudo *et al.*, Chitayat *et al.*, Spinner *et al.* and Mizutani does not teach the claimed subject matter. In view of the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.*, Spinner *et al.* and Mizutani, it is respectfully submitted that this rejection be withdrawn with respect to independent claim 11 (which claims 12-15 depend there from).

IV. Rejection of Claim 16 Under 35 U.S.C. §103(a)

Claim 16 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Sudo *et al.* in view of Chitayat *et al.*, Spinner *et al.*, Gerard (US Patent 4,751,437) and Mizutani. It is respectfully submitted that this rejection should be withdrawn for the following reasons. Sudo *et al.*, Chitayat *et al.*, Spinner *et al.*, Gerard and Mizutani, individually or in combination, do not teach or suggest each

and every element set forth in the subject claims.

As stated *supra*, applicants' claimed subject matter relates to a system and method to control a rotary-linear actuator. An integrated rotary-linear actuator system is provided that includes a control system and an associated rotary-linear motor, which may be integrated into a single module. The motor includes a moveable plunger and associated coils. When the coils are energized, they interact with magnets to effect corresponding movement of the plunger, which may include rotation and/or linear movement. Independent claim 16 recites an integrated rotary-linear actuator system, comprising: *means for supporting a plurality of motors…; means for moving a stage and adapted to be received by the well,…; means for providing a magnetic field arranged on the means for moving the stage,…; means for applying a substantially axial force on the means for providing the magnetic field and driving the means for moving the stage linearly,…; means for applying a substantially tangential force on the means for providing the magnetic field for the means for moving the stage rotationally; means for amplifying an electrical signal…; control means for controlling the means for amplifying,…; and* ***means for determining the position of the plunger, the means for determining the position of the plunger is affixed to a surface of the magnet field and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the means for supporting a plurality of motors***. Sudo *et al.*, Chitayat *et al.*, Spinner *et al.*, Gerard and Mizutani., individually or in combination, fail to teach or suggest such aspects of the claimed subject matter.

Sudo *et al.* discloses a positioning device of magnetic suspension type, comprising a stationary member; a movable member to be disposed in a non-contact state to the stationary member; magnetic support means including at least one magnetic circuit for supporting the movable member in non-contact state with respect to the stationary member by using the magnetic forces generated by the magnetic circuit; detecting means for detecting the position of the movable member relative to the stationary member; and driving means for generating a drive force for moving and positioning the movable member relative to the stationary member. (*See* col. 1, lines 46-68).

In contrast, applicants' claimed subject matter discloses an integrated rotary-linear actuator system that includes a control system and an associated rotary-linear motor, which may be integrated into a single module. The motor includes a moveable plunger and associated coils. When the coils are energized, they interact with magnets to effect corresponding movement of the plunger, which may include rotation and/or linear movement. The system further includes a processor coupled to one or

more amplifiers. Each of the amplifiers is coupled to a respective one of the coils and is operative to control energization of the respective coils.

The processor also is connected to the encoder system for receiving position information indicative of the position and/or movement of the plunger. The encoder system is affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. The processor thus controls the amplifiers, and in turn, controls energization of each phase of the respective coils based on the position information so as to effect desired movement of the plunger. (*See* pg. 7, lines 5-8 and pg. 11, line 30-pg. 12, line 10).

Whereas, Sudo *et al.* merely discloses a position detection means for detecting the position of the floating member relative to the stationary member. Sensors are provided on upper and lower portions of the outer periphery of the inner cylinder of the stationary member. Each of the sensors consist of eddy current type distance sensors and can measure the distance of the floating member up to the inner periphery of the inner cylinder. (*See* col. 4, lines 1-10). Sudo *et al.* does not disclose a means for determining the position of the plunger affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Sudo *et al.* is silent with regard to a ... ***means for determining the position of the plunger, the means for determining the position of the plunger is affixed to a surface of the magnet field and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the means for supporting a plurality of motors***.

Chitayat *et al.* does not make up for the aforementioned deficiencies of Sudo *et al.* with respect to independent claim 16. Chitayat *et al.* discloses a two-axis motor with high density magnetic platen. An X-Y positioning machine has a forcer, with armature coils, that moves around on a platen, supported by an air bearing. Magnets embedded in the motor platen generate a fixed magnetic field with which the armature coils interact. (*See* col. 1, lines 40-67). The Examiner cites Chitayat *et al.* for providing an array of magnets wherein half of the magnets are oriented such that their north poles point radially outward and the other half such that their north poles point radially inward, the array arranged as alternating columns of alternating polarity. (*See* Office Action dated 8-21-06, pg. 9). Thus, Chitayat *et al.* does not disclose a means for determining the position of the plunger affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Chitayat *et al.* is silent

with regard to a ... ***means for determining the position of the plunger, the means for determining the position of the plunger is affixed to a surface of the magnet field and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the means for supporting a plurality of motors***.

Spinner *et al.* does not make up for the aforementioned deficiencies of Sudo *et al.* and Chitayat *et al.* with respect to independent claim 16. Spinner *et al.* discloses a distributed intelligence control system for controlling a cross direction profile characteristic of a traveling sheet, such as paper, during production. The system includes a scanner for measuring a property of the sheet at a plurality of cross direction locations and producing output signals indicative of the cross direction profile characteristic. The system further includes a plurality of actuators, each actuator being operatively associated with a corresponding intelligent actuator controller. (*See* col. 3, lines 35-50). The Examiner cites Spinner *et al.* for providing an intelligent actuator controller mounted on the body of the actuator and thus integrated with the actuator. Each actuator controller comprises a communications transceiver that comprises a "network interface" via passing communications from an actuator controller to the network and host control system. (*See* Office Action dated 8-21-06, pg. 9). Thus, Spinner *et al.* does not disclose a means for determining the position of the plunger affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Spinner *et al.* is silent with regard to a ... ***means for determining the position of the plunger, the means for determining the position of the plunger is affixed to a surface of the magnet field and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the means for supporting a plurality of motors***.

Gerard does not make up for the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.* and Spinner *et al.* with respect to independent claim 16. Gerard discloses a wide bandwidth linear motor system. The linear motor includes a coil assembly with a structure which suppresses secondary resonances, thereby permitting the linear motor to be used in a wide bandwidth servo control loop. The coil assembly includes a cylindrical coil support, a bushing coaxial, a plurality of radial ribs and a coil having multiple turns. (*See* col. 2, lines 24-50). The Examiner cites Gerard for providing a "means for amplifying an electrical signal" via the linear motor and servo loop drive circuit including an amplifier which supplies current to the coil. (*See* Office Action dated 8-21-06, pg. 10). Thus, Gerard does not disclose a means for determining the position of the plunger affixed to the surface of

the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Gerard is silent with regard to a ... ***means for determining the position of the plunger, the means for determining the position of the plunger is affixed to a surface of the magnet field and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the means for supporting a plurality of motors***.

Mizutani does not make up for the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.*, Spinner *et al.* and Gerard with respect to independent claim 16. Mizutani discloses a servo motor integral with a control apparatus. The servo motor has an amplifier section and a partition body which constitutes a partition between an amplifier section and a servo motor section. The integrated apparatus is contained within a housing that provides support for the elements and includes a printed circuit board, bearings and position/velocity detector. (*See* col. 4, lines 13-26). The Examiner cites Mizutani for providing a servo motor integral with its control apparatus. (*See* Office Action dated 8-21-06, pg. 10). Thus, Mizutani does not disclose a means for determining a position of the plunger affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Mizutani is silent with regard to a ... ***means for determining the position of the plunger, the means for determining the position of the plunger is affixed to a surface of the magnet field and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the means for supporting a plurality of motors***.

Thus, the combination of Sudo *et al.*, Chitayat *et al.*, Spinner *et al.*, Gerard and Mizutani does not teach the claimed subject matter. In view of the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.*, Spinner *et al.*, Gerard and Mizutani, it is respectfully submitted that this rejection be withdrawn with respect to independent claim 16.

V. <u>Rejection of Claim 22-27 Under 35 U.S.C. §103(a)</u>

Claims 22-27 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sudo *et al.* in view of Chitayat *et al.*, Horikoshi *et al.* (US 5,142,172), Gerard, Spinner *et al.* and Mizutani. It is respectfully submitted that this rejection should be withdrawn for the following reasons. Sudo *et al.*, Chitayat *et al.*, Horikoshi *et al.* Gerard, Spinner *et al.*, and Mizutani, individually or in combination, do not teach or suggest each and every element set forth in the subject claims.

As stated *supra*, applicants' claimed subject matter relates to a system and method to control a rotary-linear actuator. An integrated rotary-linear actuator system is provided that includes a control system and an associated rotary-linear motor, which may be integrated into a single module. The motor includes a moveable plunger and associated coils. When the coils are energized, they interact with magnets to effect corresponding movement of the plunger, which may include rotation and/or linear movement. Independent claim 22 recites an integrated rotary-linear actuator system, comprising: *a plunger movable along and rotatable about a longitudinal axis extending through the plunger,...; a coil system having coils arranged to, when energized, interact with the magnets attached to the plunger to move the plunger in a rotational mode and/or a linear mode; an amplifier coupled to the coils to provide electric energy to the coils; a control system and a network interface integrated into a single module,...; and* ***an encoder system coupled to the control system for determining the position of the plunger..., the encoder system is affixed to a surface of the permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the coils based on the position information from the encoder system so as to effect desired movement of the plunger***. Sudo *et al.*, Chitayat *et al.*, Horikoshi *et al.*, Gerard, Spinner *et al.* and Mizutani., individually or in combination, fail to teach or suggest such aspects of the claimed subject matter.

Sudo *et al.* discloses a positioning device of magnetic suspension type, comprising a stationary member; a movable member to be disposed in a non-contact state to the stationary member; magnetic support means including at least one magnetic circuit for supporting the movable member in non-contact state with respect to the stationary member by using the magnetic forces generated by the magnetic circuit; detecting means for detecting the position of the movable member relative to the stationary member; and driving means for generating a drive force for moving and positioning the movable member relative to the stationary member. (*See* col. 1, lines 46-68).

In contrast, applicants' claimed subject matter discloses an integrated rotary-linear actuator system that includes a control system and an associated rotary-linear motor, which may be integrated into a single module. The motor includes a moveable plunger and associated coils. When the coils are energized, they interact with magnets to effect corresponding movement of the plunger, which may include rotation and/or linear movement. The system further includes a processor coupled to one or

more amplifiers. Each of the amplifiers is coupled to a respective one of the coils and is operative to control energization of the respective coils.

The processor also is connected to the encoder system for receiving position information indicative of the position and/or movement of the plunger. The encoder system is affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. The processor thus controls the amplifiers, and in turn, controls energization of each phase of the respective coils based on the position information so as to effect desired movement of the plunger. (*See* pg. 7, lines 5-8 and pg. 11, line 30-pg. 12, line 10).

Whereas, Sudo *et al.* merely discloses a position detection means for detecting the position of the floating member relative to the stationary member. Sensors are provided on upper and lower portions of the outer periphery of the inner cylinder of the stationary member. Each of the sensors consist of eddy current type distance sensors and can measure the distance of the floating member up to the inner periphery of the inner cylinder. (*See* col. 4, lines 1-10). Sudo *et al.* does not an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Sudo *et al.* is silent with regard to ... ***an encoder system coupled to the control system for determining the position of the plunger…, the encoder system is affixed to a surface of the permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the coils based on the position information from the encoder system so as to effect desired movement of the plunger***.

Chitayat *et al.* does not make up for the aforementioned deficiencies of Sudo *et al.* with respect to independent claim 22. Chitayat *et al.* discloses a two-axis motor with high density magnetic platen. An X-Y positioning machine has a forcer, with armature coils, that moves around on a platen, supported by an air bearing. Magnets embedded in the motor platen generate a fixed magnetic field with which the armature coils interact. (*See* col. 1, lines 40-67). The Examiner cites Chitayat *et al.* for providing an array of magnets wherein half of the magnets are oriented such that their north poles point radially outward and the other half such that their north poles point radially inward, the array arranged as alternating columns of alternating polarity. (*See* Office Action dated 8-21-06, pg. 12). Thus, Chitayat *et al.* does not disclose an encoder system affixed to the surface of the magnets and

etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Chitayat *et al.* is silent with regard to ... ***an encoder system coupled to the control system for determining the position of the plunger…, the encoder system is affixed to a surface of the permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the coils based on the position information from the encoder system so as to effect desired movement of the plunger***.

Horikoshi *et al.* does not make up for the aforementioned deficiencies of Sudo *et al.* and Chitayat *et al.* with respect to independent claim 22. Horikoshi *et al.* discloses a linear-motion driving device. The linear-motion driving device includes a moveable shaft, a gas bearing for supporting the movable shaft, a housing for supporting the gas bearing, and a motor having a voice coil for displacing the movable shaft. (*See* col. 1, lines 35-50). The Examiner cites Horikoshi *et al.* for providing air bearings supporting the plunger against an actuator support stage via gas bearings used to support a shaft of a voice coil at a desired position. (*See* Office Action dated 8-21-06, pg. 13). Thus, Horikoshi *et al.* does not disclose an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Horikoshi *et al.* is silent with regard to ... ***an encoder system coupled to the control system for determining the position of the plunger…, the encoder system is affixed to a surface of the permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the coils based on the position information from the encoder system so as to effect desired movement of the plunger***.

Gerard does not make up for the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.* and Horikoshi *et al.* with respect to independent claim 22. Gerard discloses a wide bandwidth linear motor system. The linear motor includes a coil assembly with a structure which suppresses secondary resonances, thereby permitting the linear motor to be used in a wide bandwidth servo control loop. The coil assembly includes a cylindrical coil support, a bushing coaxial, a plurality of radial ribs and a coil having multiple turns. (*See* col. 2, lines 24-50). The Examiner cites Gerard for providing an amplifier coupled to the coils to provide electric energy to the coils via the linear motor and servo loop

drive circuit including an amplifier which supplies current to the coil. (*See* Office Action dated 8-21-06, pg. 13). Thus, Gerard does not disclose an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Gerard is silent with regard to ... ***an encoder system coupled to the control system for determining the position of the plunger…, the encoder system is affixed to a surface of the permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the coils based on the position information from the encoder system so as to effect desired movement of the plunger***.

Spinner *et al.* does not make up for the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.*, Horikoshi *et al.* and Gerard with respect to independent claim 22. Spinner *et al.* discloses a distributed intelligence control system for controlling a cross direction profile characteristic of a traveling sheet, such as paper, during production. The system includes a scanner for measuring a property of the sheet at a plurality of cross direction locations and producing output signals indicative of the cross direction profile characteristic. The system further includes a plurality of actuators, each actuator being operatively associated with a corresponding intelligent actuator controller. (*See* col. 3, lines 35-50). The Examiner cites Spinner *et al.* for providing an intelligent actuator controller mounted on the body of the actuator and thus integrated with the actuator. Each actuator controller comprises a communications transceiver that comprises a "network interface" via passing communications from an actuator controller to the network and host control system. (*See* Office Action dated 8-21-06, pg. 13). Thus, Spinner *et al.* does not disclose an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Spinner *et al.* is silent with regard to ... ***an encoder system coupled to the control system for determining the position of the plunger…, the encoder system is affixed to a surface of the permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the coils based on the position information from the encoder system so as to effect desired movement of the plunger***.

Mizutani does not make up for the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.*, Horikoshi *et al.*, Gerard and Spinner *et al.* with respect to independent claim 22. Mizutani discloses a servo motor integral with a control apparatus. The servo motor has an amplifier section and a partition body which constitutes a partition between an amplifier section and a servo motor section. The integrated apparatus is contained within a housing that provides support for the elements and includes a printed circuit board, bearings and position/velocity detector. (*See* col. 4, lines 13-26). The Examiner cites Mizutani for providing a servo motor integral with its control apparatus. (*See* Office Action dated 8-21-06, pg. 13). Thus, Mizutani does not disclose an encoder system affixed to the surface of the magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger. Accordingly, Mizutani is silent with regard to… ***an encoder system coupled to the control system for determining the position of the plunger…, the encoder system is affixed to a surface of the permanent magnets and etched with a pattern of reflective and non-reflective regions that are scanned by optical pickups to register movement of the plunger, wherein the control system controls the amplifier and, in turn, controls energization of each phase of the coils based on the position information from the encoder system so as to effect desired movement of the plunger***.

Thus, the combination of Sudo *et al.*, Chitayat *et al.*, Horikoshi *et al.*, Gerard, Spinner *et al.*, and Mizutani does not teach the claimed subject matter. In view of the aforementioned deficiencies of Sudo *et al.*, Chitayat *et al.*, Horikoshi *et al.*, Gerard, Spinner *et al.*, and Mizutani, it is respectfully submitted that this rejection be withdrawn with respect to independent claim 22 (which claims 23-27 depend there from).

CONCLUSION

The present application is believed to be in condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

In the event any fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063 [ALBRP140USB].

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicants' undersigned representative at the telephone number below.

Respectfully submitted,
AMIN, TUROCY & CALVIN, LLP

/Marisa Joy Zink/
Marisa Joy Zink
Reg. No. 48,064

AMIN, TUROCY & CALVIN, LLP
24TH Floor, National City Center
1900 E. 9TH Street
Cleveland, Ohio 44114
Telephone (216) 696-8730
Facsimile (216) 696-8731